Get a grounding in the basic concepts

Level: Introductory

developerWorks staff

August 1, 2003

This page will guide you to material that will help you get started using Linux. Linux is not UNIX, although it is intended to be very UNIX-like. IBM has offerings in both the Linux and the UNIX spheres -- as well as many others.

Contents:

So what is Linux, anyway?

What is the difference between UNIX and Linux?

Why is Linux important?

What can I do with Linux?

How do I get started with Linux?

How can I use Linux in applications development?

What kind of programming languages can I use on Linux?

What does Web services have to do with Linux?

How does Linux fit in with Grid computing?

I understand Linux, but how can I continue to improve my skills?

How can I demonstrate to others that I have Linux skills?

What IBM tools are available for Linux?

What lies ahead for Linux?

Resources

Rate this article

Related content:

So what is Linux, anyway?

In the simplest terms, Linux is an operating system. It was created in October 1991 by a University of Helsinki student named Linus Torvalds (Linux stands for Linus's UNIX). Linux itself is actually just the kernel; it implements multitasking and multiuser functionality, manages hardware, allocates memory, and enables applications to run.

The average user will never be interested enough in any operating system to want to know about things like kernel internals. Only the truly dedicated -- those who have no personal lives, or those who are being paid to do this kind of work -- are going to want to explore these intricacies.

But even if you never descend to the giddy depths of kernel hacking yourself, it is reassuring to know that you can easily hire a contractor or firm to do this work for you; to commission such modifications for a proprietary system is very often a more difficult and more costly undertaking.

For the beginner, probably the most important thing about the kernel that you need to remember is that odd-numbered kernel versions (in other words, 2.3, 2.5, 2.7) are the experimental, development kernel. Stable, release kernels carry even numbers (in other words, 2.4, 2.6, 2.8).

A typical Linux *distribution* includes the Linux kernel, but it also contains many application programs and tools. For the most part, many system- and user-level tools found in a Linux distribution come from the Free Software Foundation's GNU project (GNU standing for "GNU's Not UNIX").

Both the Linux kernel and the GNU tools suite are released under the GNU General Public License, or GNU GPL. If you are not already familiar with the GNU GPL, the best way to begin to understand it is to go and read it. At the risk of summarizing away some important parts, the GNU GPL is a way

of setting computer code free so that the people who use that code may meddle and experiment with it to their hearts' content.

- We highly recommend this interesting writeup of Linux history from Linus Torvalds' former officemate, Lars Wirzenius.
- Linux Online offers non-partisan Linux news and information.
- Also check out these helpful Linux links, compiled by the Linux at IBM researchers.
- Linux at IBM's *Linux Line* offers Partner news, Linux learning resources, success stories, and new development -- all with an IBM Linux focus.
- The IBM Linux Technology Center works directly with the Linux community; its Web site tracks IBM contributions to Linux and related development communities.

developerWorks Linux zone

Technical FAQ for Linux users

Linux glossary for Windows users

Subscribe to the developerWorks newsletter

developerWorks Toolbox subscription

Also in the Linux zone:

Tutorials

Tools and products

Code and components

Articles

What is the difference between UNIX and Linux?
Invented at AT&T Bell Labs in 1969, UNIX (the name is a play on the earlier "Multics" operating system) is a robust, flexible, and developer-friendly computing environment. Written originally for the Digital Equipment Corporation (DEC) family of PDP microcomputers, this most popular of multi-user, general-purpose operating systems has taken over roles in all areas of computing -- even those once held by mainframes.

Some twenty-odd years into its history, UNIX began to be eclipsed -- in some of its roles, anyway -- by Linux. Linux is not UNIX; it is merely very UNIX-like. For some jobs, you want Linux -- for others, you still want UNIX. UNIX and Linux play very well together, and well-written programs are extremely easy to port between the two systems. For more information about UNIX at IBM, please see some of the following sites.

- On the software front, you can learn more about IBM's AIX 5L UNIX operating system.
- From its earliest days IBM has been known as a world-class hardware vendor. Check out the features offered in IBM pSeries UNIX computers -- designed to most powerfully run Linux as well as UNIX.
- The IBM developer domain portal offers best practices and tips for users. In particular, the IBM eServer Developer Domain has articles, product help, and resources covering IBM server hardware from Intel-based to mainframe, and software from Linux and UNIX to z/OS.
- The z/OS UNIX System group offers a page of free UNIX tools and toys from IBMers and the community.
- To learn more about Multics (Multiplexed Information and Computing Service), visit the Multics home page.

UNIX and IBM
IBM has offerings in both the Linux and the UNIX spheres -- as well as many others.

- To read more about UNIX at IBM, please see the IBM High Performance Computing page.
- IBM's products and services page offers quick links to hardware and software, support, consulting, and more.
- To navigate the greater IBM site, visit IBM's home page.

Why is Linux important?
Because it is free software, licensed under the GNU General Public License, Linux obviates the need for programmers to keep reinventing the operations layer with each new project. To wax metaphorical, the GNU family of tools provide royalty-free bricks and mortar with which to begin building independent projects. Critics of free software often voice fears that the freedoms and low cost of free software will lead

to economic disaster for the computing sector. However, it is just as likely -- if not more likely -- that free software will do for the world of computing what Gutenberg's printing press did for the world of Letters.

- The GNU General Public License explains what freedoms and responsibilities are mandated to users of free software.
- You can read more about the "philosophy" of free software -- and find a great deal of documentation and software packages available for download -- at the Free Software Foundation (FSF) Web site.
- The IBM Public License (IPL) is also a free software license. It was created with the help of FSF founder Richard Stallman.
- The Open source projects zone at IBM developerWorks offers downloads released under open and/or free licenses.

What can I do with Linux?
What you want out of your Linux system will determine which Linux system you want and how many layers of complexity you need to understand before you begin to work with it.

Linux is an excellent learning platform to do kernel hacking, to learn UNIX, or to learn programming; many tools and applications are available to play games, to do desktop publishing, or just to hang out doing e-mail and Web browsing.

It is also an excellent platform for working systems, both open and closed, because it is so heavily customizable for free. Linux is a popular platform for everything from middleware to embedded computing and clusters, to parallel supercomputers and gadgets. IBM has been involved in projects to manufacture cash registers that run on Linux, as well as the Linux wristwatch. Other developers have used Linux on such devices as cell phones, Sony PlayStation, TiVo, and the Sharp Zaurus.

While the GNU General Public License requires altered code to be released to the customers who use it, it is not required that all altered code be released to the general public (this is a key point that some critics of free software fail to grasp). Indeed, in the case of Linux-based cash registers, it would in all likelihood be a security risk to release the code to a wide audience. The GNU GPL merely requires that the modified code be made available to the customers who use it.

- The article "What good is a Linux client?" is just one good starting point for learning more about the Linux operating environment.
- The IBM developerWorks Linux zone is an indispensable resource for tutorials and articles covering everything from Linux basics to advanced programming and deployment.
- The proof-of-concept Linux on a wristwatch project was a very popular and well-received effort by IBM Research.
- Read about IBM's intelligent vending machine.
- Learn about exciting Linux projects and on-demand computing from the Linux at IBM portal page.
- Linux Services Overview highlights IBM's Linux solutions with a particular focus on e-business use and applications.
- IBM Global Services offers consulting and support; its services include everything from implementing new installations to migrating or updating old ones. Get a feel for what IGS is doing in the Linux sphere at the Linux services page, or see what kinds of solutions it has been coming up with lately by reading some of the Linux at IBM Case studies.

How do I get started with Linux?
If you are completely new to Linux, or if you are using Linux as a desktop operating system, you need to learn at least some basics about system administration and security. Unlike commercial personal operating systems that attempt to automate such operations, Linux does not promise to hold your hand or to clean up

after you: you have to take care of the system yourself. Luckily, basic maintenance and basic security are pretty easy. In many ways, Linux and UNIX administration is today much easier than administration for popular commercial personal operating systems because it is much more transparent.

While Linux does have several windowing environments that allow you to perform administration, the most straightforward way to control the system is at the command line. Built in to the structure of the command-line environment are dozens of commands and several text-based help systems.

There are a great many resources on the Web and in the real world to help you get started with Linux. There are Web sites, articles, and books devoted to the subject, and Linux User Groups (also known as LUGs) meet in cities and countries around the world -- and are well-known for being very friendly even to very new users.

- *Linux Online* offers a comprehensive list of Linux User Groups worldwide.
- The comprehensive "Technical FAQ for Linux users" will help new and beginning users get off to the right start.
- The "Linux glossary for Windows users" is another useful (if not indispensable) resource for the newbie.
- The IBM developerWorks Linux zone offers many standalone and serial tutorials with a focus on basics; from compiling the Linux kernel and compiling and installing software to partitioning and backing up your Linux systems.
- "Speed-start your Linux app 2003: Basic tasks for new Linux developers" offers basics on navigating Linux and using basic tools and commands.
- "Addressing security issues in Linux" is a 39-page guide to common security issues from IBM's Mark Chapman.

How can I use Linux in applications development?
Linux is an excellent choice as a programming platform. It is GCC compliant, which means that you can use the GNU Project's excellent suite of programming and debugging tools -- absolutely free, and with all of the freedoms that the GNU GPL guarantees. Commercial programming packages, like commercial operating systems, can cost a great deal of money. True, they are often needed for one project or another and can be well worth the cost, but for a beginner or a learner -- and for many professionals -- free software is simply irreplaceable. If you are using Linux as a development platform, do not skip first learning administration and security. It is a foolish programmer indeed who is not master of his or her own computer.

- IBM's billion-dollar support of Linux makes headlines; its support of Linux developers aims to make the job of applications programming easier. Whether yours is a mundane or a cutting-edge project, you'll want to check out the resources that are available at the Linux at IBM: Developers site.
- The UnitedLinux common code base promises to make programming on Linux even easier.
- The IBM developerWorks online newsletter: technology edition is devoted to bringing you the articles and information you need to keep up with the latest techniques and developments.
- IBM Redbooks, put out by IBM's International Technical Support Organization (ITSO), provide a similar service. You'll particularly like the online hints and tips for a wide range of disciplines.
- The print version of the *IBM developerWorks journal* is also a valuable resource.

What kind of programming languages can I use on Linux?
In addition to steadfast stalwarts like Fortran and C/C++, many scripting and other computer languages are at home on (or were even designed to work best with) Linux. The most popular include Perl, Python, PHP, and Tcl.

Dynamic new technologies such as the Java technology and XML run swimmingly on Linux, as do any number of more esoteric programming languages, from Logo and Rebol to Smalltalk and many more.

- The GCC home page at GNU offers a wealth of free tools and support.
- David Mertz's *Charming Python* column at IBM developerWorks keeps you up to date on techniques and technologies in the world of Python.
- Perl lovers will gain a wealth of practical advice from Ted Zlatanov's *Cultured Perl* column and his *Road to better programming* series at IBM developerWorks.
- The IBM project, SashXB for Linux, offers a clever, Java-based mini-RAD environment for Linux.
- IBM developerWorks offers an entire zone devoted to Java technology and programming.
- The IBM developerWorks XML zone is an award-winning and invaluable online resource for developers of all disciplines.
- IBM offers a Toolbox subscription featuring a single-user, low-cost annual license for access to core IBM tools, middleware, and technologies.
- You will also be interested in the Downloads for product tutorials and Speed-start programs page at IBM developerWorks.

What does Web services have to do with Linux?
Web developers face many choices when selecting technology on which to base their e-business applications. Because Linux is standards compliant, many innovative and new technologies -- from open efforts such as Java technology and XML to cutting-edge services such as voice applications, wireless, pervasive computing, and even Web services -- are all Linux friendly.

- The IBM developerWorks Web services zone is just one place to learn more about the exciting world of Web services programming.
- alphaWorks Web Services offers new Web services technologies and the IBM Emerging Technologies Toolkit (ETTK).
- The IBM Web services page features products and news, demos, and partner stories from IBM.
- You will also be interested in the IBM On demand business overview.
- IBM's WebSphere Studio Application Developer and WebSphere Application Server offer a product-level development environment for Web services.

How does Linux fit in with Grid computing?
It has not always been easy to make a Linux or UNIX box play nice with the other operating systems on the block, and it still isn't always a piece of cake. However, the same can be said of practically any operating system in existence today.

Great strides have been made in interoperability and portability, and this is one area in which new tools and techniques are continuing to be developed.

This category of Linux work includes porting and networking, including writing or rewriting device drivers. While device drivers are just as tricky as other advanced aspects of Linux, it is necessary to reinvent them from time to time, so as to connect various systems and peripherals, old and new, to your Linux or UNIX box. Thus it is a blessing that they are generally smaller in scope than the kernel and the other advanced aspects of the system.

- David Mertz guides you through basic Linux networking principles in the IBM developerWorks article "Sharing computers on a Linux (or heterogeneous) network" (also see Part 2). For more introductory networking material, see "Setting up a Local Area Network".
- Putting together the pieces of a complex grid can be puzzling, but you will discover a wealth of

programming and practical skills in the IBM developerWorks Web architecture zone.

- Taking your installation to a wireless plane is simpler than you may think. Gain programming savvy and connectivity insights in the IBM developerWorks Wireless zone.
- Gain an understanding of the Grid model with these exclusive IBM resources, the introductory-level "Grid computing key components paper," and the whitepapers and articles at the e-business on demand -- Virtualization Resource center.
- The IBM Grid Toolbox includes the Globus Toolkit 2.2, documentation, and custom installation scripts that facilitate the creation of grids and grid applications.
- Once you are all set up, the IBM developerWorks Grid computing zone will keep you abreast of the latest information, tools, and support to keep your grid operating smoothly.

I understand Linux, but how can I continue to improve my skills?
If you want to use Linux as a platform for a very advanced application or application set, you will be interested in aspects of the system such as kernel hacking, the differences between various filesystems, and other nitty-gritty details.

Another skill set that is often needed for high-end applications (or games) is fine-tuning a Linux machine, cluster, or network for optimum performance. This includes expertise in things such as multiprocessing, threading, clusters, and other arcane but sophisticated points of system administration. Understanding these aspects of Linux aren't quite as gritty as actual kernel hacking, but can nonetheless get pretty hairy.

IBM Learning Services offers classes that cover everything from the basics to development to highly specialized skills -- as well as certification (more about this later). IBM Developer solutions offers articles and howtos on IBM products, and the greater IBM Web site offers many resources, many if not most of which also run on Linux. And IBM developerWorks offers articles, tutorials, and resources on Linux as well as several other open or free technologies including XML, Wireless, Web services, Java technology, and Grid computing.

- Speed-start your Linux app 2003 offers a collection of IBM Linux resources including training and tech support for developing Linux applications.
- See the Learning Linux and Linux Education resources from the Linux at IBM pages.
- IBM Learning Services offers online training with e-learning solutions.
- IBM developerWorks Live! Technical Briefings events are a great way to learn more about IBM technologies. You'll find details on these and other IBM Linux events at the Linux at IBM: Events page and at the IBM developerWorks Linux events listing.
- IBM's International Technical Support Organization, the ITSO, not only publishes IBM Redbooks, it also holds worldwide workshops.
- When time is not available for formal learning, IBM developerWorks and IBM developer solutions allow you to keep up with changes and technologies on your own time and terms.

How can I demonstrate to others that I have Linux skills?
Various certification efforts exist for Linux training. These include consortium programs as well as independent skills tests and company-sponsored certification. IBM offers several certification tracks for Linux expertise.

- See what certification tracks for Linux are available from IBM Training and Certification services.
- IBM also offers professional certification in UNIX and Linux hardware and various software technologies (including IBM products).
- IBM developerWorks provides two extensive tutorial series devoted to preparing for Linux Professional Institute (LPI) certification. Begin with the 101 series: Part 1 covers Linux

fundamentals; Part 2, Part 3, and Part 4 cover administration. In the 102 series, Part 1 shows how to compile programs from source code; Part 2 teaches about compiling the kernel itself; Part 3 gets into networking; and Part 4 delves into security.

- Visit The LPI to learn more about their certification program.
- Red Hat also offers certification for its distributions.

What IBM tools are available for Linux?
Linux is a superior operating system on which to run standard applications -- from office applications such as word processors and spreadsheets; to database systems; to Web publishing and serving environments. IBM Products such as DB2, Lotus, Tivoli, and WebSphere all run on Linux, and IBM is not the only industry leader to recognize that Linux is an excellent platform for middleware. Though misunderstood and very often maligned -- at least, among the self-proclaimed digerati -- middleware is an essential (and for many computer users, *the* essential) reason for having computers around in the first place. The open nature of Linux allows middleware vendors to fine-tune solutions to meet users' needs in ways that no closed system allows.

- Speed-start your Linux app 2003 offers a free Software Evaluation Kit (SEK) for Linux. The SEK features DB2 Universal Database, WebSphere Application Server, WebSphere Studio Site Developer, WebSphere MQ, Lotus Domino, Tivoli Access Manager, and more.
- Why DB2 for Linux? offers information, downloads, and links to learn more about IBM's premier database systems.
- The WebSphere Portal Zone will answer all of your questions about application serving, e-business, and infrastructural middleware.
- Best known for its messaging and collaboration capabilities, Lotus software suite's integrated functionality also allows for team conferencing, e-learning, knowledge management, and more.
- Tivoli technologies extend systems management and integrate Linux machines with other IT systems. See also IBM information on Autonomic computing.

What lies ahead for Linux?
Linux's openness and flexibility lend its use to work in laboratories and other research facilities on the bleeding edge of revolutionary technological change. Research at IBM includes all areas of information technology, from physics and cognitive science to leading-edge application research and more. But researchers at IBM are also involved, in many instances, in pure science. At IBM as elsewhere, Linux is frequently in use in these settings.

Linux can easily be clustered or customized for highly original experiments or prototypes, simulations, or tests; and the vast array of free software tools that Linux was created to work with can be used in the same creative way. Even with all of the exciting new technologies that are being developed today -- from Grid computing and wireless voice applications to artificial intelligence and Quantum computing -- the potential and promise of the computing age in which we live is still largely untapped. Linux's robust and open flexibility means that it will remain at the forefront of the development frontier for years to come.

- IBM Research explores everything from genetics to nanotechnology, and artificial intelligence to quantum teleportation. Keep up with their latest efforts on the IBM Research news page.
- We weren't kidding about the Quantum teleportation. You might also be interested in reading about Quantum computing.
- IBM's Pervasive Computing Lab is not only pervasive; it's also very impressive.
- IBM Research Austin is the home of the IBM Linux Technology Center.
- IBM's Blue Gene supercomputers run Linux. See also the *Fast Company* article on Blue Gene and

Autonomic computing.

- The IBM Scholars Program partners with universities to provide academic and research offerings as well as resources and benefits in subjects ranging from Linux to Life Sciences.

Resources

Linux is by nature standards compliant. Linux developers as a rule place very high importance on keeping the operations layer, as well as those built atop it, open, interoperable, and standards friendly.

- The Linux Standard Base (or LSB) offers Linux-specific industry specifications and certification programs. The LSB is a working group of the Free Standards Group.
- Designed to be LSB compliant, the UnitedLinux effort offers a streamlined common code base. UnitedLinux is a consortium project by four leading Linux vendors.
- Often associated very strongly with UNIX, The Open Group is a vendor-neutral, technology-neutral, international consortium whose goal is secure and reliable interoperability across the computing world.
- The IEEE's Portable Application Standards Committee (PASC) is responsible for the POSIX family of UNIX standards.
- The Requests for Comments (RFC) document series is a set of technical and organizational notes about the Internet. Maintained by the IETF Secretariat, the RFC publication process plays an important role in the Internet standards process.

e-mail it!

What do you think of this document?

Killer! (5) Good stuff (4) So-so; not bad (3) Needs work (2) Lame! (1)

Comments?

Submit feedback